

REMARKS

I. Introduction

By the present Amendment, claims 1, 4, and 11 have been amended. Claims 2 and 3 have been cancelled. Accordingly, claims 1, 4-7, and 9-20 remain pending in the application. Claims 1 and 11 are independent.

II. Office Action Summary

In the Office Action of October 20, 2009, claims 1-6, 11-16, and 18-20 were rejected under 35 USC §103(a) as being unpatentable over Japanese Patent No. 2000060857 to Miwa et al. ("Miwa") in view of Ophir et al. ("Ophir"), and still in further in view of U.S. Patent No. 5,524,636 issued to Sarvazyan. Claims 7 and 17 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir and Sarvazyan, and still further in view of U.S. Patent No. 7,050,610 issued to Chen et al. ("Chen"). Claims 9 and 10 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir and Sarvazyan, and further in view of Yamashita et al. ("Yamashita"). These rejections are respectfully traversed.

III. Rejections under 35 USC §103

Claims 1-6, 11-16, and 18-20 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir, and further in view of Sarvazyan.

Regarding this rejection, the Office Action indicates that Miwa discloses a system that includes an ultrasound probe, a first image production means, an image display, at least one piece of reference information, a second image, and a variation operation. The Office Action admits that Miwa fails to explicitly disclose a distortion operation, or displaying of distortion information. Ophir is relied upon for disclosing a

distortion operation that is based on the comparison of a locus of points in a region of interest in the two images, and displaying the distortion information. The Office Action concludes that it would have been obvious to modify the system of Miwa to incorporate the distortion operation and display of distortion information as taught by Ophir in order to allow detection of cancerous tumors. Applicants respectfully disagree.

As amended, independent claim 1 defines a diagnostic ultrasound system that comprises:

- a probe for measuring a subject using ultrasound by bringing said probe into contact with a subject in a first state;

- a first image production means for producing a first image of said subject according to information sent from said probe;

- an image display means for displaying said first image produced by said first image production means;

- a second image production means for producing a second image of said subject according to information measured by bringing the probe into contact with said subject in a second state different from said first state in that pressure is applied to the subject;

- a distortion operation means for calculating distortion information on a desired region-of-interest in said second image corresponding to the desired region-of-interest on said first image;

- a display control means for controlling the display of the distortion information, which is calculated by said distortion operation means, on said image display means;

- a means for setting a reference information and the desired region-of-interest on said first image displayed by said image display means;

- a variation operation means for calculating a macro displacement, which is a positional change of the reference information set on said first image into a counterpart visualized in said second image, and for calculating a micro displacement, which is the deformation change of the region-of-interest in said first image into a counterpart visualized in said second image; and

- a means for displaying the relationship between said macro displacement and said micro displacement calculated by said

variation operation means and the distortion information calculated by said distortion operation means.

The diagnostic ultrasound system of independent claim 1 includes a probe for measuring a subject using ultrasound by bringing the probe into contact with the subject in a first state, a first image production means for producing a first image of the subject according to information sent from the probe, an image display means for displaying the first image produced by the first image production means, and a second image production means for producing a second image of the subject according to information measured by bringing the probe into contact with the subject in a second state that is different from the first state. The ultrasound system also includes a distortion operation means for calculating distortion information on a desired region-of-interest in the second image corresponding to the desired region-of-interest on the first image, a display control means for controlling display of the distortion information which is calculated by the distortion operation means on the image display means, and a means for setting reference information and the desired region-of-interest on the first image display by the image display means.

A variation operation means is provided for calculating a macro displacement corresponding to a positional change of the reference information set on the first image into a counterpart visualized in the second image, and for calculating a micro displacement corresponding to the deformation change of the region-of-interest in the first image into a counterpart visualized in the second image. The ultrasound system additionally includes means for displaying the relationship between the macro displacement and the micro displacement calculated by the variation operation means and the distortion information calculated by the distortion operation means. According to such an arrangement, it is possible to perform accurate

quantitative comparison and/or evaluation of the hardness and softness of a tissue within different regions-of-interest set in the subject regardless of changes in compression force.

The office action alleges that the combination of Miwa and Ophir discloses all of the features recited in independent claim 1. Review of these references, however has failed to reveal any disclosure or suggestion for the newly added features of independent claim 1. In particular, these references do not appear to disclose calculation of macro displacement which corresponds to the positional change of the reference information on the first image into a counterpart visualized in the second image. Similarly, these references fail to disclose calculation of a micro displacement corresponding to the deformation change of the region-of-interest in the first image into a counterpart visualized in the second image. Since the references do not disclose these features, they are incapable of displaying the relationship between the macro/micro displacements and the distortion information. The cited reference simply fail to provide any disclosure or suggestion for features now recited in independent claim 1, such as:

a variation operation means for calculating a macro displacement, which is a positional a change of the reference information set on said first image into a counterpart visualized in said second image, and for calculating a micro displacement, which is the deformation change of the region-of-interest in said first image into a counterpart visualized in aid second image; and

a means for displaying the relationship between said macro displacement and said micro displacement calculated by said variation operation means and the distortion information calculated by said distortion operation means.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 4-7, 9, 10, and 18 - 20 depend from independent claim 1 and are therefore believed allowable for at least the reasons set forth above with respect to independent claim . In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 11 defines a method for displaying information on distortion of biological tissue in an ultrasound ultrasonic image. The method comprises:

- a first image production step for measuring a subject using ultrasound by bring a probe into contact with a subject in a first state, and producing a first image of said subject according to the measurement information;
- an image display step for displaying said first image produced at said first image production step;
- a step for setting a reference information and a desired region-of-interest on said first image displayed at said image display step;
- a second image production step for measuring a subject using ultrasound by bring said probe into contact with said subject in a second state different from said first state in that pressure is applied to the subject, and producing a second image of said subject according to the measurement information;
- a variation operation step for calculating a macro displacement, which is a positional change of the reference information set on said first image into a counterpart visualized in said second image and for calculating a micro displacement, which is the deformation change of the region-of-interest in said first image into a counterpart visualized in said second image;
- a step for seeking a relationship between the macro displacement and the micro displacement calculated at said variation operation; and
- a display control step for controlling the display of said relationship, which is sought at said step for seeking, at said image display step.

The method independent 11 recites various features that are similar to those recited in independent claim 1. For example, a variation operation step

is performed to calculate a macro displacement corresponding to a positional change of the reference information set on the first image onto a counterpart visualized in the second image, and also calculate a micro displacement corresponding to the deformation change of the region-of-interest in the first image into a counterpart that is visualized in the second image. Additionally, a relationship is determined between the macro displacement and the micro displacement. As previously discussed with respect to independent claim 1, the art of record fails to provide any disclosure or suggestion for determining a relationship between the change of distance between the feature points and different images and the distortion information. It is therefore, respectfully submitted that independent claim 11 is allowable over the art of record.

Claims 12-17 depend from independent claim 11, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 11. In addition, these claims each introduce novel elements that independent render them patentable over the art of record.

IV. Conclusion


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 389.44528X00).

Respectfully submitted,
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